

HIGH DENSITY PLASMA CHEMICAL VAPOR DEPOSITION PROCESS

ABSTRACT OF THE DISCLOSURE

5 High-density plasma CVD processes with improved gap filling characteristics are provided. In one exemplary process, the process includes loading a semiconductor substrate into a process chamber. First main process gases, including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas and a hydrogen gas, are then injected into the process chamber.

10 Thus, a high-density plasma is generated over the semiconductor substrate, and the semiconductor substrate is heated to a temperature in the range of about 550°C to about 700°C by the high-density plasma. Thus, a silicon oxide layer is formed to completely fill a gap region without any voids or defects in the semiconductor substrate. In addition, the first main process gases can be

15 replaced with second main process gases including a silicon source gas, an oxygen gas, a nitrogen free chemical etching gas, a hydrogen gas and a helium gas.